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Factors affecting vaccination demand in Indonesia: a secondary analysis and multimethods national assessment

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ABSTRACT

Objectives Vaccine hesitancy remains a major barrier to immunisation coverage worldwide. We explored influence of hesitancy on coverage and factors contributing to vaccine uptake during a national measles–rubella (MR) campaign in Indonesia.

Design Secondary analyses of qualitative and quantitative data sets from existing cross-sectional studies conducted during and around the campaign.

Methods Quantitative data used in this assessment included daily coverage reports generated by health workers, district risk profiles that indicate precampaign immunisation programme performance, and reports of campaign cessation due to vaccine hesitancy. We used t-test and χ^2 tests for associations. The qualitative assessment employed three parallel national and regional studies. Deductive thematic analysis examined factors for acceptance among caregivers, health providers and programme managers.

Results Coverage data were reported from 6462 health facilities across 395 districts from 1 August to 31 December 2018. The average district coverage was 73%, with wide variation between districts (2%–100%). One-third of districts fell below 70% coverage thresholds. Sixty-two of 395 (16%) districts paused the campaign due to hesitancy. Coverage among districts that never paused campaign activities due to hesitancy was significantly higher than rates for districts ever-pausing the campaign (81% vs 42%; p<0.001). Precampaign adequacy of district immunisation programmes did not explain coverage gaps (p=0.210). Qualitative analysis identified acceptance enablers including using digital health monitoring and feedback systems, increasing caregiver knowledge and awareness, making immunisation social norm, effective cross-sectoral collaboration, conducive service environment and positive experiences for mothers and children. Barriers included misinformation diffusion on social media, halal–haram issues, lack of healthcare provider knowledge, negative family influences and traditions, previous poor experiences and misinformation on adverse events.

Conclusion Barriers to vaccine uptake contributed to coverage gaps during national MR campaign in Indonesia. A range of supply-related and demand-related strategies were identified to address hesitancy contributors. Advancing a portfolio of tailored multilevel interventions will be critical to enhance vaccine acceptance.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The strength of this assessment was the combined use of multiple contemporaneously collected quantitative and qualitative data sets collected during and around a large national measles–rubella campaign in Indonesia. This included the application of a digital health platform that generated real-time daily coverage data, alongside a precampaign assessment of immunisation programme performance in each district.
⇒ The quantitative assessment provides insights on the links between vaccine hesitancy and coverage; additional qualitative analysis explored key contextual enablers and barriers to vaccine uptake.
⇒ The limitations of the study are the use of secondary data. While vaccine hesitancy emerged as major barrier to vaccine update, the study was not designed a priori to examine this issue.
⇒ In addition, denominators on numbers of children eligible for immunisation are not always precise, leading to some inaccuracy in coverage estimates. Finally, data on other district level geographic, demographic and socioeconomic covariates were not assessed.

INTRODUCTION

While routine childhood immunisation remains one of the most cost-effective interventions for reducing deaths among children under 5 years old, achieving and maintaining high coverage remain a serious challenge in many contexts. Globally, about 19.7 million children under 1 year of age do not receive full basic immunisation.[1] More than 1 million children under 5 years were incompletely vaccinated in Indonesia alone, with full immunisation coverage at just 58% for 12–23 months old in 2018–2020.[2–4] First vaccine doses had the highest coverage among primary vaccinations, specifically BCG at 87% and hepatitis B-0 at 83%—figures largely driven by doses administered at birth in the context of the high proportion of health facility births.[2] Inequities exist across the

country, with wide variation across regions, households, wealth quintiles and educational attainment levels.[5 6]

Vaccine hesitancy is regarded as among the top threats to global health.[7] Hesitancy is defined as 'a delay in acceptance or refusal of vaccines despite availability of vaccination services' and is influenced by a complex set of interrelated factors such as complacency, convenience and confidence.[8] While emerging strategies to counter hesitancy primarily target individuals' knowledge, awareness and attitudes, there is less evidence on the role of community or population-based contributors. Noting that vaccine hesitancy is context-specific, varying across time, place and vaccine type,[8] an in-depth analysis of the local context is needed to develop practical, community-level strategies to overcome these barriers.[9]

While considerable measures have been employed to increase vaccination uptake in Indonesia, a complete picture of vaccine acceptance and hesitancy remains unexplored.[10–12] The government has highlighted the importance of vaccination by including a target of achieving 80% coverage by 2024 in its development planning agenda.[13] Childhood vaccination has been promoted as a social norm, and substantial efforts have been made to improve access and reduce stockouts.[5 13] However, negative perceptions of side effects, lack of community awareness and religious concerns regarding each vaccine's 'halal-haram status', related to the inclusion of porcine ingredients in the manufacturing process and its permissibility under Islamic law, potentially influence vaccine hesitancy in the country.[14 15]

In 2018, Indonesia undertook a national measles–rubella (MR) campaign targeting over 32 million children aged between 9 months and 15 years old. This ambitious campaign took place in 28 of the country's 34 provinces, representing some of the archipelago's most remote and diverse regions.[16] While most districts initiated the campaign on time, early concerns emerged regarding the halal status of the vaccine. Major religious groups withdrew support early after campaign onset, leading to suspensions in dozens of districts. Doubts about the vaccine spread widely through social media, many schools refused participation, and parents withheld vaccination from their children. Importantly, Indonesia was in a pre-election period, and the timing of the religious suspensions corresponded with heightened political activity.

Coverage achieved during the campaign was 73% with a wide subnational variation.[17] To better understand the potential contributors to observed coverage gaps and the potential role of vaccine hesitancy, confidence and uptake, we conducted a multimethods assessment of the available qualitative and quantitative datasets collected during and immediately after the national campaign.

METHODS

Several quantitative and qualitative datasets were generated during and after the 2018 nationwide MR campaign, to understand potential contributors to and effects of vaccine hesitancy, confidence and uptake. The datasets used for assessment are detailed in online supplemental table 1.

Quantitative data analysis

Quantitative data were generated from several sources during the MR campaign (1 August–31 December 2018). First, coverage data were provided by a digital health platform that was used as a complementary tool for health facilities across 28 provinces to report on daily numbers of vaccinated children during the campaign. This provided granular detail on vaccination coverage at the district, provincial and national levels.[18 19] Second, district-level risk profiles served as a proxy for the immunisation programmes' relative performance, based on a WHO Measles Risk Assessment Tool.[20] This Excel-based tool assesses subnational programmatic risk as the sum of indicator scores in four categories: population immunity, surveillance quality, programme performance and threat assessment. Each subnational area is assigned to a programmatic risk category of low, medium, high or very high risk based on the overall risk score. Third, a data set from the Ministry of Health (MoH) was compiled, which provided a list of districts that had ever stopped MR campaign activities based on information from local health authorities, UNICEF consultants and MoH staff.

We used the district as unit of analysis, given Indonesia's highly decentralised governance context where districts have decision-making power and are the unit of administrative authority. Coverage rates were calculated against estimated targets identified by the MoH and presented as proportions of the total estimated targets reached by the end of the campaign. Coverage data are presented in two ways: *Percent coverage at the end of the campaign* (continuous variable) and *Coverage at least 70% at the end of the campaign* (yes/no). Coverage variables were also considered by key characteristics: (1) *Ever* paused *campaign due to hesitancy* (yes/no); and (2) *Risk profile* (low/medium/high/very high). Districts in higher risk categories were those where the precampaign capacity of immunisation services was comparatively lower.

Data analysis was conducted in Stata (V.16.0). An unpaired Student's t-test was used to identify differences in *Percent coverage* against districts that *Ever paused the campaign due to hesitancy*. χ^2 Tests were used to identify differences in *Coverage of at least 70%* by categorical variables *Ever paused campaign due to hesitancy* as reported by MoH, and *Risk profile*.

Qualitative data analysis

We analysed transcripts from three qualitative studies that took place during and after the MR campaign (October 2018–July 2019): (1) Evaluation of the Second Phase of MR Campaign study (interviewing vaccinators and programme managers); (2) Evaluation of Reach Every Child study (focus group discussions with caregivers and stakeholders and service providers); and (3) Rapid Assessment of Immunisation among Urban Poor study

(interviewing stakeholders and focus group discussions with mothers and *cadres*—community health volunteers who are the forefront of immunisation service delivery at the community level in Indonesia, and who serve as a bridge between the respective community and health facility). More information regarding these datasets is available in online supplemental table 1.

Deductive thematic analysis was used to assess local perceptions regarding vaccine hesitancy, confidence and uptake among the groups assessed.[21] Two researchers reviewed the transcripts several times to become familiar with the data. All transcripts were analysed using NVivo software (QSR International, V.12.4, 2019).[22] A coding system was created based on the WHO's Increasing Vaccination Model[17] (online supplemental figure 1) and Model to Identify Vaccine Hesitancy (online supplemental figure 2). Codes were mapped to six themes based on UNICEF's The Caregivers' Journey to Health and Vaccination (online supplemental figure 3): (1) knowledge, awareness and belief; (2) intent; (3) preparation, cost and efforts; (4) point of service; (5) experience of care; and (6) after service. Lastly, themes were categorised according to their role as potential enablers or barriers to vaccine acceptance. While there were many overlapping concepts, each was categorised under a single subtopic to reduce the complexity of interpreting results. Themes are presented by which group endorsed it (caregivers/stakeholders/both) and the surrounding ecological environment (individual/family/community/ health system/political system).

Patient and public involvement

No identifiable individual patient data were collected during this study.

RESULTS

Quantitative findings

We analysed data from 6462 health facilities across 395 districts and 28 provinces collected between 1 August and 31 December 2018. At the end of the campaign, while the average district coverage was 73%, substantial variation across districts was observed (range 2%–100%). One-third of districts fell below the 70% threshold (figure 1). Sixty-two of 395 (16%) districts paused the campaign due to hesitancy. Coverage rates for districts that never paused their campaign due to hesitancy were significantly higher than coverage rates for districts that ever-paused campaign activities (81% vs 42%; t=12.3, p<0.001). The proportion of districts that fell below the 70% coverage threshold was significantly higher among districts that ever-paused activities compared with districts that never-paused activities (77% vs 25%; χ^2=66.0, p<0.001).

Levels of coverage below 70% were identified among districts across the spectrum of risk profiles. The proportion of districts that fell below the 70% coverage threshold was not significantly different between low (27%), medium (29%), high (34%) and very high (41%) risk profile districts (χ^2=4.5, p=0.210).

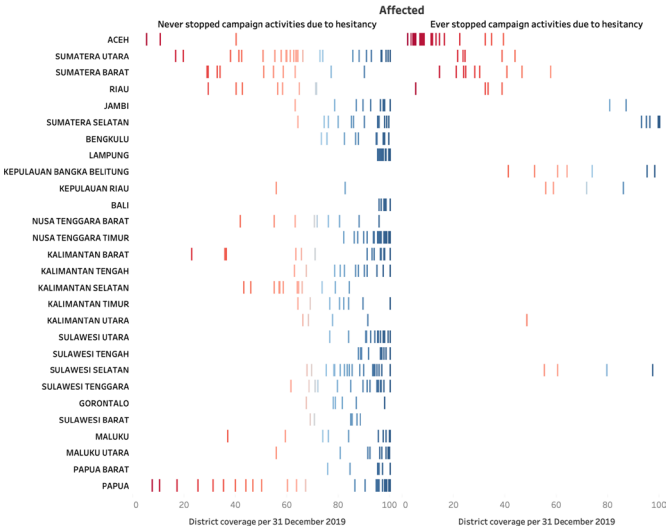

Figure 1 District coverage during the 2018 nationwide measles–rubella campaign, for 28 provinces and 395 districts of Indonesia (each line represents one district).

Qualitative findings

Qualitative findings on enablers and barriers to vaccine acceptance are discussed for each theme. Additional detail on enablers and barriers is shown in tables 1 and 2, respectively, with exemplar quotations available in table 3.

Knowledge, awareness and belief

Caregivers and stakeholders asserted the dual function of media and digital health improved vaccine acceptance and reduce hesitancy. They reported that receiving scheduled vaccination and non-vaccination reminders and health information through SMS messages enhances uptake. Social media played a vital role in educating the community. However, stakeholders and caregivers agreed that the media could also increase vaccine hesitancy by widely and rapidly disseminating rumours, misinformation, negative news stories (eg, adverse events following immunisation (AEFI), vaccine halal status) and hoaxes.

Caregivers and stakeholders considered that knowledge and awareness increased vaccine acceptance, as vaccination was generally perceived as beneficial to prevent illness and improve child health and development. Levels of awareness among the nuclear and extended family might contribute to either endorsement or discouragement of vaccination. Most caregivers relied on local village health posts and maternal and child health books to obtain vaccination-related information. Further, local health staff highlighted that providers' lack of knowledge (eg, village midwives and cadres) could increase hesitancy, and lower confidence then uptake.

Intent

Many caregivers implied that vaccination is already considered a social norm in their local areas, with vaccination embedded in daily conversations during the

Table 1 Enablers to vaccine acceptance: results of qualitative data analysis

No	Findings by steps	Key actors C	Key actors S	Level of the surrounding environment
A. Knowledge, awareness and belief				
1	Sufficient knowledge (mothers and cadres) will increase awareness. A high level of knowledge (on benefits of vaccine) and awareness will outweigh doubts coming from fear of Adverse Events from Immunisation (AEFI).	√	√	Individual
2	Use of the Maternal Child Health book to record and monitor their children's vaccination status and to improve knowledge on vaccination.	√		Individual
3	Disseminating information through brochures and stickers, especially during a vaccination campaign.		√	Individual
4	Use of digital health to send reminder messages and other health information. Other forms of digital health include the power of media (television or social media), by disseminating information (knowledge, schedule and others) through different platforms (Instagram, Facebook, WhatsApp and YouTube).	√	√	Individual, community
5	WhatsApp groups facilitate information dissemination related to vaccination. Dissemination of information can also be channelled through collaboration with university students (*Kuliah Kerja Nyata*).		√	Community
6	Making an endorsement video with influential leaders and playing this video at health centres to increase acceptance.		√	Community
7	Awareness among the family (core and extended family) may lead to an endorsement of vaccination.	√		Family
8	Continuous education, information dissemination and advocacy to the community on the importance of vaccination, supported by disseminating the correct information and rebuttal of hoaxes through social media.		√	Health system
9	For every new vaccine, there should be proper training about the vaccine so cadre or healthcare providers can conduct socialisation with the community. Adequate knowledge could reduce vaccine hesitancy.		√	Health system
B. Intent				
1	Perception of vaccination as a social norm.	√		Community
2	Cross-sectoral collaboration to handle caregivers who reject vaccination and to increase vaccine coverage. Higher coverage is found among those who perceive that the religious leaders endorse vaccination.		√	Community
3	The role of the Indonesian Islamic Ulema Council (*Majelis Ulama Indonesia*) is highly needed, especially in areas where the halal–haram issue is highlighted.		√	Community
4	The requirement to provide a certificate of immunisation when enroling in elementary school has effectively increased vaccine acceptance among caregivers.	√	√	Political system
5	In a few primary health centres (Puskesmas), vaccination has been mandated as a priority by the head of the Puskesmas. This kind of endorsement is seen as useful, as vaccinators focus their attention on the programme's acceptance.		√	Political system, health system
C. Preparation, cost and effort				
1	Healthcare workers, cadres, and influential community leaders reminding about the village health post schedule on the same date every month creates an important mental note for caregivers.	√	√	Individual, community, health system
2	Community and religious leaders make a significant contribution by announcing schedules, visiting challenging sites, making endorsement videos, and using their power to enforce vaccination.	√	√	Community
3	Religious entities play roles in supporting vaccination (eg, announcing the vaccination schedule through the mosque).	√	√	Community
4	Providing an alternative day/time for village health post implementation.		√	Health system
5	Ensuring the vaccine stock never runs out (available and kept in an ideal condition) and is easily accessible.	√	√	Health system
6	All vaccination services are available free of charge.	√	√	Health system
D. Point of service				
1	Caregivers will choose free vaccination service providers, although they know of several available providers.	√		Individual

Continued

Table 1 Continued

No	Findings by steps	Key actors C	Key actors S	Level of the surrounding environment
2	Attractive environment (eg, healthcare workers are wearing casual attire, watching movies together while waiting) in Puskesmas or village health post to prevent boredom.	√	√	Health system
3	Attractive rewards can increase village health post attendance, for example, providing free milk for children.	√	√	Health system
4	Availability of service for every child, irrespective of their parents' residential ID.	√	√	Health system
E. Experience of care				
1	Positive experiences increase compliance (eg, hospitable attitude from health service providers, short waiting time, never experience/experience only mild side effects, etc).	√		Individual
2	Caregivers said that they still have confidence in health-related information disseminated by official health providers (doctors as experts). Health service providers must have the most updated knowledge about vaccination. Cadres are considered useful for schedule reminders.	√		Individual, health system
3	Give brief information on vaccines and their function before injection, as information coming straight from health professionals is considered trustworthy.	√		Individual
F. After service				
1	When caregivers are aware of the possibility and examples of AEFI, and prophylactic medicines are made available for these, they tend to be less worried about AEFI.	√		Individual
2	Adequate information is perceived as a solution; therefore, DHOs plan to conduct refreshing training for healthcare providers twice a year to increase their knowledge and ability to disseminate information, and consequently reduce fear of AEFI.		√	Health system

Source: prepared by the authors from the study data.
C, caregivers; DHO, district health office; Puskesmas, primary health centre; S, stakeholders (healthcare providers, DHO, cadres).

campaign. Patterns of intention to vaccinate were similar within families. When a family member felt vaccination was unnecessary, they contacted relatives to influence their decision. Caregivers explained they were influenced by family tradition on both sides of the family. For example, a mother may have refused to vaccinate simply because her family had never accepted vaccination, and 'the children turned out just fine'. Many caregivers and stakeholders revealed that gender and family dynamics could overpower knowledge and intention. Despite their concerns, wives followed their husbands if they did not permit vaccination.

Cross-sectoral collaboration between district health office (DHO) officials and ministries, military, religious leaders and influential figures proved to be one of the most effective approaches for changing the intention to vaccinate from rejection to acceptance. DHO highlighted the importance of involving influential leaders in the targeted community. Furthermore, local government decrees making an immunisation certificate a requirement for enrolment in elementary school had effectively contributed to increased intention to vaccinate.

Preparation, cost and effort

Caregivers and stakeholders explained that community and religious leaders helped the community prepare for vaccination by announcing schedules and inviting caregivers to vaccinate their children on vaccination day. Scheduling of vaccination services remained an issue, especially for caregivers who worked outside the home or did seasonal work such as farming. Some providers tried alternative days/times for village health posts to accommodate schedules. Further, both healthcare providers and programme managers expressed that alternative solutions were needed to cater to the community's varied needs without adding to the burden on healthcare providers.

Caregivers in urban slums who might be informal residents reported that being unfamiliar with the health system and uncertainty regarding whether local facilities would accept their children for vaccination made them hesitant to go for vaccination. Importantly, significant efforts were needed to overcome geographical and seasonal barriers, such as living on islands, dependency on the tides, and the rainy season.

Service delivery points

Health providers and caregivers mentioned that attractive rewards such as free food supplementation for the children could increase vaccination attendance. A convenient and attractive environment was preferred by caregivers (eg, midwives wearing casual attire, friendliness, movies in the waiting area) and made the children less scared. DHO reported that some caregivers considered the primary vaccine series contained too many injections, which contributed to hesitancy.

Caregivers felt that primary healthcare centres and village health posts complemented each other. While vaccination services at primary care centres were available every day, they were felt to be crowded, had long waiting times and tended to be farther away. In village health posts, vaccination services were usually available

Table 2 Barriers to vaccine acceptance: results of secondary data analysis

No	Findings by steps	Key actors C	Key actors S	Level of the surrounding environment
A. Knowledge, awareness and belief				
1	Caregivers' fears of injection and AEFI overpower the perceived benefits (health, disease prevention).	√	√	Individual
2	Media can also increase vaccine hesitancy; for example, negative news related to vaccination (AEFI, death, halal status of the vaccine) or hoaxes disseminated through social media.	√	√	Individual, community
3	Halal–haram issue was mentioned, even though no exact clarification is available. The halal–haram issue is also coupled with many different issues (AEFI, fear of injection, etc)	√	√	Community
4	Many caregivers with no ID card admitted that they had concerns around visiting village health post and Puskesmas. They claim not to know that vaccination services are available for every child.	√	√	Family
5	Influence from the family (core and extended) may lead to the discouragement of vaccination.	√		Family
6	Lack of knowledge could result in health workers not being able to provide the community with adequate information about the vaccination.		√	Health system
B. Intent				
1	Some homeless caregivers mentioned that they never received the endorsement from the community leaders and stated that this would not result in compliance.	√		Individual
2	Perception that the MR vaccination programme is only about politics.		√	Individual
3	Fears among some caregivers that the vaccination campaign is a trial project that can result in child paralysis.		√	Individual, political system
4	In some areas, there were caregivers who interact less with their neighbours, claiming not to be exposed to vaccination-related conversations.	√		Individual, community
5	News about counterfeit vaccines or the substances in the vaccine.	√		Community
6	Gender roles can overpower knowledge. Even though childcare is perceived as the mother's responsibility, mothers will not disobey their husbands when they do not permit their children to be vaccinated.	√	√	Family
7	Family tradition affects acceptance.	√		Family
8	Information also flows between those who are related, even though they do not live nearby. When one family believes you do not have to accept vaccination, they contact their relatives and influence them.		√	Family
C. Preparation, cost and effort				
1	Conflicting schedules remain an issue and might hamper vaccination.	√	√	Individual, health system
2	Many farmers (and their children) are not available during the vaccination schedule in a few areas where farming is the main activity. Children usually skip school during these times.		√	Community
3	Population mobility in urban slums results in hesitancy due to unfamiliarity with the health system among the new residents. The high incidence of urban slum mobility results in data on vaccination targets becoming relatively outdated.		√	Community
4	Geographical barrier is a factor that decreases vaccine coverage: areas far from the health centres, that cannot roads cannot reachhere access depends highly on the weather.		√	Community
5	Vaccine storage remains an issue in several locations.		√	Health system
D. Point of service				
1	Caregivers are afraid of having their children receive multiple injections at the same time or within a short period.	√	√	Individual, health system
2	The vaccination service at Puskesmas is very crowded, often with longwaiting times. The Puskesmas is also relatively far from caregivers' homes, involving extra time and costs.	√		Individual, health system
3	In village health posts, vaccination services are only provided at fixed time points (usually once a month) and highly depend on the midwife's availability.	√	√	Individual, health system
4	Higher socioeconomic groups tend to use private providers (creating challenges for recording and reporting), whereas lower socioeconomic groups opt for a public provider.		√	Individual
E. Experience of care				
1	Previous bad experience (any AEFI, long waiting time, inconvenience during the waiting time (eg, hot weather), absence of informed consent before injection, fear of injection) introduces hesitancy in mothers and children.	√	√	Individual
F. After service				

Continued

Table 2 Continued

No	Findings by steps	Key actors C	Key actors S	Level of the surrounding environment
1	An unrelated, unfortunate event after the vaccination can be associated with the vaccination and increase vaccine hesitancy.		√	Individual
2	AEFI impacts vaccine acceptance. Both health workers (trauma) and beneficiaries (rejection) are affected.	√	√	Individual

Source: prepared by the authors from the study data.
AEFI, adverse event following immunisation; C, caregivers; MR, measles–rubella vaccine; Puskesmas, primary health centre; S, stakeholders (healthcare providers, district health office, cadres).

only once a month. However, these were nearer to the caregivers' homes and less crowded, making them more convenient. Caregivers recommended adding health workers to reduce waiting time. Caregivers with greater wealth more frequently used private service providers. DHO acknowledged the need for proper recording and

Table 3 Selected excerpts from qualitative analyses

Themes	Excerpts
Enablers of vaccine acceptance	
a. Knowledge, awareness and belief	"I was vaccinated as a child, so I follow my parents' way …" and, "my sister always advises me to vaccinate my children. She likes to make sure that I never miss a schedule, telling me that if I missed it, my child would get sick."
b. Intent	"These days, children have to have an immunization certificate to get accepted in elementary school. So many caregivers were already aware that their children have to have complete immunization records."
c. Preparation, cost and effort	"Aside from the cadre … maybe the wife of our head of hamlet. She usually asks, 'how many caregivers should attend the village health post?' and then she will reach out to us."
d. Point of service	"We can monitor the number of participants daily, so if any district did not meet their target on a particular day, I can contact them directly and ask them, 'What is the problem? Why were you unable to meet the target?'… the same for the overall target. If we have an evaluation at the end of the week and we find that there are still areas that did not meet their target, we can intervene immediately."
e. Experience of care	"I like to ask questions during the immunization, [I] want to ask the doctors. [The vaccination is] to protect the child from diseases, so the child [does] not quickly get sick."
f. After service	"So, I asked the vaccinator to explain to the mothers before the injection. For example, after this BCG vaccination, your child might experience a fever, but you do not have to worry because you can give her paracetamol. When you give vaccination, many of the antibodies are released in your child's body; this way, you can convince them. Don't just provide them with the injection and then when the child has a fever, the mother will panic and not know how to handle that. The next thing you know is a decrease in the number of mothers bringing their children for vaccination the next month because other mothers are afraid and refuse to have their children vaccinated."
Barriers to vaccine acceptance	
a. Knowledge, awareness and belief	"Yes, we will indeed do everything for our child, Sir. But, if the child gets feverish, coupled with [my] parent's advice, 'Just don't do the immunization, children in the old days were not vaccinated and [were] still healthy' – many parents [think] that way, especially my mother … 'Just don't do the immunization, your child will be paralyzed and can't walk.' So I was down [demotivated]. Hence, for my child, if my mother says 'Don't', I will not immunize my child."
b. Intent	"Sometimes, the father does not allow [immunisation] because he is afraid. The child can get feverish; that worries the father because he [the father] does not understand."
c. Preparation, cost and effort	"Moreover, I am in Ancol, [we have an issue with] the population movement; now [s/he is] in Ancol and next month [s/he] moves to Cilincing [village name], then the following month [s/he] moves again. [It's] very nomadic. Eviction from Aquarium village comes and moves to Marunda Cilincing, so [they] move a lot."
d. Point of service	"First, I'm lazy, going to Puskesmas usually requires [one] to queue, whereas my child needs to go to school [implies time-consuming]. Second, [it's] far thus needs travel cost. It's okay if I have extra money, but when I do not …"
e. Experience of care	"So, the child gets trauma because of injection, [they are] afraid. The diphtheria injection causes the child to get inflammation; thus, [they are] afraid. The [other] child was crying; thus, others were afraid. Even stepping on the scales, [they are] all afraid."
f. After service	"Yes, AEFI has an enormous impact. First, it's traumatic for the health worker. Second, [it has] significant [impact] on the environment. For instance, one whole school or one entire village could reject. Tangerang Selatan also still has an issue with halal-haram [status of the] vaccine because there is an influencing actor there. This, in addition to the heterogeneity, the immunization could be a success in one area [but not necessarily in all areas], thus still needs improvement."

AEFI, adverse event following immunisation.

reporting from both public and private facilities for more accurate coverage calculations.

Experience of care

Many caregivers shared that their compliance with vaccination originated from their positive previous experiences (eg, hospitable attitudes of health service providers, short waiting times, good vaccine education, no or only mild side effects). Likewise, previous bad experiences (eg, prior AEFI, long waiting times, hot weather, absence of informed consent and fear of injections) introduced hesitancy.

Many caregivers said they placed confidence in health-related information from health providers; doctors especially were deemed trustworthy. During the vaccination session, caregivers expected to receive information about the vaccine—its purpose, benefits, potential side effects and what to do if those happen—to feel confident about the vaccination.

After service

Some caregivers' fear of perceived AEFI (eg, fever, disability, swelling and pain at the injection site) outweighed the perceived benefits of immunisation. Healthcare providers and cadres acknowledged that AEFI and other events after vaccination could enhance hesitancy among both caregivers and health workers. Health workers were encouraged to educate caregivers regarding potential AEFI and how to overcome these.

DISCUSSION

Indonesia experienced wide variations in immunisation coverage during its national MR immunisation campaign. Despite achieving 73% coverage overall, the range varied from 2% to 100% between districts, with one-third falling below 70% coverage. Cessation of the campaign due to vaccine hesitancy was strongly associated with low coverage. Furthermore, there was no association between the pre-existing performance of district immunisation programmes and low coverage. Indeed, close to one-third of historically well-performing districts failed to achieve 70% coverage—highlighting the outsized role vaccine hesitancy during the campaign. These findings suggest that conventional assessments of risk profiles may need to be revisited to better account for the potential contribution and episodic nature of vaccine hesitancy.

The qualitative assessment uncovered a range of factors contributing to vaccine acceptance in the Indonesian context. Enablers of acceptance included the use of digital health monitoring and feedback mechanisms, levels of caregiver knowledge and awareness, social norms around the importance of immunisation, the breadth of cross-sectoral engagement in support of immunisation services, the environment of service delivery points and ensuring positive experiences for both mothers and children. Barriers to vaccine acceptance included the spread of misinformation on social media, issues of vaccine halal–haram status, lack of healthcare provider knowledge, negative family influences and traditions, prior negative experiences and concerns related to AEFI.

Our findings on the need for sufficient knowledge are in agreement with other studies that caregivers and their families need continuous reminders about why vaccination is important.[23–25] Gender norms and traditional family structures have the potential to overpower knowledge. This aligns with prior research that found that well-informed caregivers tend to follow their husband's prohibition of vaccination.[25] Positive perceptions by healthcare workers and caregiver engagement were essential to overcome hesitancy.[26] We found that health providers, specifically doctors and midwives, remain a trusted source of information[24 27 28] and that educational videos at health services help disseminate information. Caregivers expected that health providers educate them before giving injections, including possible AEFI and how to overcome these. Education on common reactions and how to differentiate them from more serious AEFI was an important component of the overall outreach strategy.[12 24 26] The lack of provider knowledge in Indonesia highlighted the need for efforts to upgrade competencies. Prior studies consistently asserted the importance of training and have called for innovative and practical training for health workers.[9 23 25 26]

This research also suggests that government efforts on increasing health service provision to reduce access barriers remain important in enabling immunisation uptake. While only few described economic reasons as barriers, caregivers mentioned indirect costs (eg, transportation costs), a finding supported by prior research.[9 10 19] For this reason, we propose the village health post could be the focus of vaccination services in Indonesia (figure 2), taking advantage of their location close to caregivers' homes.[11 12] Certainly, existing limitations on ensuring availability of immunisation services such as restricted schedules and irregular availability of village midwives as one of service points also need to be addressed.[12] Caregivers recommended increasing the number of health workers and space, creating a more attractive environment for children, and improving the quality of care and interpersonal interactions with health workers.[10 23 25 29]

Strategies to engage diverse stakeholders in generating positive social norms around vaccination are a critical complement to health sector engagement.[24 29] In the Indonesian context, both caregivers and primary healthcare staff asserted that invitations from both religious leaders and local political heads could be transformative. In addition, we found digital reminders and health messages fostered greater acceptance, in line with previous research suggesting such reminders increase immunisation timeliness, compliance and coverage.[30–32] It has been recommended that missed opportunities for immunisation could be reduced with ongoing social media monitoring, which facilitates the timely identification of immunization-related concerns.[12] Indeed, the swift and widespread dissemination of misinformation, hoaxes and negative experiences via social media were perceived

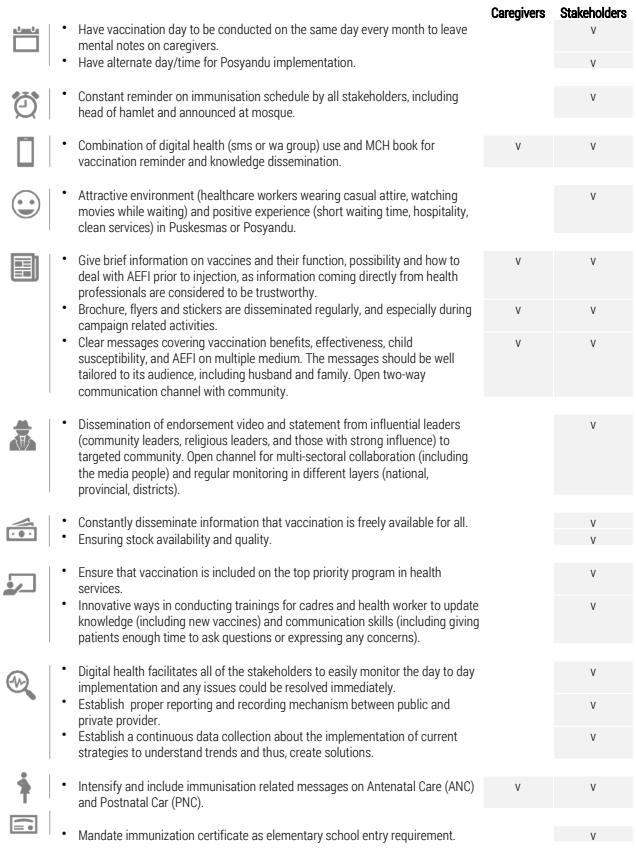

Figure 2 Recommendations for caregivers and stakeholders. AEFI, adverse events following immunisation; MCH, maternal and child health.

to deepen negative perceptions. Previous research has indicated that vaccine-hesitant parents in developing countries may be more active on social media and hence more at risk of exposure to misleading information.[33 34]

This study had several limitations that are important to draw attention to. First, while quantitative and qualitative data sets analysed were collected concurrently during and after a major national campaign, they were not specifically designed to examine vaccine hesitancy; therefore, results may not fully capture all issues. Second, limitations in accurate denominators for numbers of eligible children in some districts may have resulted in some inaccuracy in determining coverage estimates; however, this is unlikely to substantively affect the findings related to hesitancy. Third, recent data on district-level geographic, demographic or socioeconomic parameters were not available and therefore not included as covariates in the analysis. These may also influence vaccine service availability, acceptance and coverage.

CONCLUSION

In summary, challenges related to vaccine hesitancy in Indonesia are real, complex and require tailored cross-sectoral engagement. While much of the historical emphasis of immunisation planning and programmes in Indonesia has been on improving access and addressing supply-side factors, what has emerged from this assessment is the need to focus equal importance on vaccine acceptance and demand-related concerns. To respond to these issues, the Indonesian Ministry of Health has recently updated its new national immunisation strategy. The strategy calls for interventions and engagement to foster vaccine acceptance at the individual, health facility and wider community and social levels. Future monitoring and implementation research will be required to assess the effectiveness of this approach on demand-related barriers including vaccine hesitancy, and ability to overcome pervasive coverage gaps.

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